

# In-Situ Ethylene and Methane Production from CO<sub>2</sub> as Plastic Precursors, Phase II

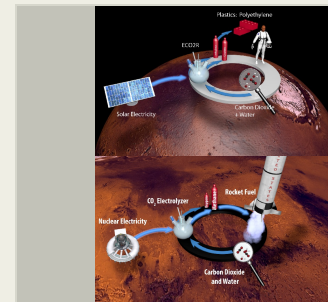
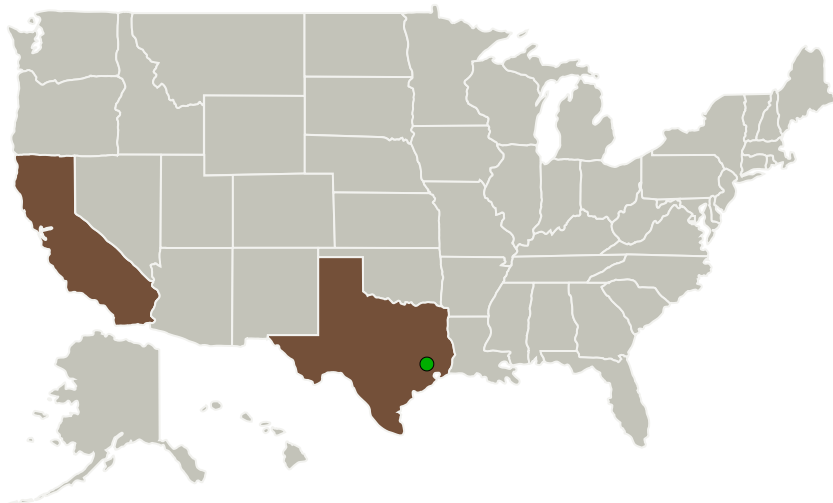
Completed Technology Project (2017 - 2020)



## Project Introduction

Opus 12 has redesigned the cathode of the commercially available PEM water electrolyzer such that it can support the reduction of carbon dioxide into ethylene and/or methane and suppress the competing hydrogen reaction. Methane and ethylene are well known polymer precursors that can be used as starting material to make plastics in extraterrestrial environments. PEM water electrolyzers have already been proven space worthy and are commercially available at various scales. Our innovation enables the creation of polyethylene and other polymers such as polyhydroxyalkanoates from the most basic starting materials: CO<sub>2</sub>, water and electricity. In Phase II, Opus 12 will continue to improve performance of the CO<sub>2</sub> conversion process and build a working prototype of ethylene and methane production that will serve as the basis for a future commercial device.

## Primary U.S. Work Locations and Key Partners



In-Situ Ethylene and Methane Production from CO<sub>2</sub> as Plastic Precursors, Phase II

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Organizations Performing Work	Role	Type	Location
Opus 12, Inc.	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Berkeley, California
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

## Primary U.S. Work Locations

California	Texas
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## Project Transitions

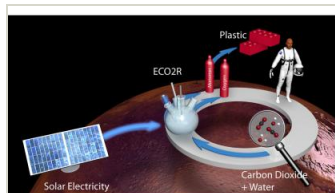
▶ **April 2017:** Project Start

✓ **January 2020:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140910>)

## Images



### Briefing Chart Image

In-Situ Ethylene and Methane Production from CO<sub>2</sub> as Plastic Precursors, Phase II Briefing Chart Image  
(<https://techport.nasa.gov/image/132171>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Opus 12, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Etosha Cave

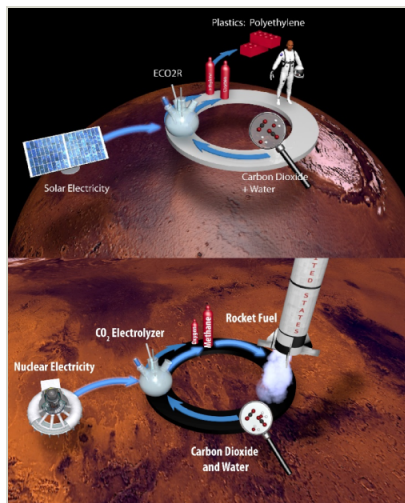
## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



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## Final Summary Chart Image

In-Situ Ethylene and Methane  
Production from CO<sub>2</sub> as Plastic  
Precursors, Phase II

(<https://techport.nasa.gov/image/136156>)

## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.1 In-Situ Resource Utilization
    - └ TX07.1.3 Resource Processing for Production of Mission Consumables

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System